



January 29, 2021

Ms. Karlene Fine
Executive Director
North Dakota Industrial Commission
State Capitol, 14th Floor
600 East Boulevard Avenue, Department 405
Bismarck, ND 58505-0840

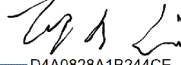
Dear Ms. Fine:

Subject: Quarterly Report Entitled "State Energy Research Center"
Contract No. SERC 2019-01; EERC Fund 24107

Attached is a copy of the subject quarterly status report for the period of October 1 through December 31, 2020.

If you have any questions, please contact me by phone at (701) 739-0630 or by e-mail at terickson@undeerc.org.

Sincerely,

DocuSigned by:

D4A0828A1B244CE...

Thomas A. Erickson
Director of Exploratory Research and
Intellectual Property and Technology
Commercialization

TAE/kal

Attachment



STATE ENERGY RESEARCH CENTER

Quarterly Project Status Report

(for the period of October 1, 2020, through December 31, 2020)

Prepared for:

Karlene Fine

North Dakota Industrial Commission
State Capitol, 14th Floor
600 East Boulevard Avenue, Department 405
Bismarck, ND 58505-0840

Contract No. SERC 2019-01

Prepared by:

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January 2021

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STATE ENERGY RESEARCH CENTER
Quarterly Progress Report
October 1 – December 31, 2020

EXECUTIVE SUMMARY

The State Energy Research Center (SERC), carried out by the Energy & Environmental Research Center (EERC), was established through Bill 2249 of the North Dakota 66th Legislative Assembly. The legislation included \$5 million of funding per biennium to fulfill three objectives: 1) conduct exploratory, transformational, and innovative research of technologies and methodologies that facilitate the prudent development and clean and efficient use of the state's energy resources; 2) provide greater access to energy experts for timely scientific and engineering studies to support the state's interests; and 3) educate stakeholders on issues related to the state's energy resources through public outreach. These objectives are being executed through three corresponding tasks:

- Task 1 – Perform Exploratory Research for North Dakota Energy
- Task 2 – Provide Prompt Expertise for North Dakota
- Task 3 – Advocate and Educate Through Outreach

A total of 25 exploratory research projects have been funded through this program to date. Seven of these projects were completed this past quarter, with eight exploratory research projects still ongoing under Task 1 of SERC. Ten projects were previously completed.

The project approved in April by the North Dakota Industrial Commission (NDIC) under Task 2 of SERC continued this quarter. This project is developing a systems dynamic model and using that model to assess the various factors affecting sustainability of North Dakota's energy industry and its impacts on 1) ensuring affordable, dispatchable energy is available for North Dakota citizens; 2) maintaining existing and expanding future employment opportunities; 3) maintaining North Dakota's healthy environment; and 4) maintaining state, tribal, and local tax revenues. Model capabilities were presented to NDIC and several legislators to demonstrate their potential to support the upcoming session.

The 2021 Energy Hawks Program initiated planning. The 2021 program will include 14 students, including eight from the University of North Dakota and six from other North Dakota institutions. Plans are being made to allow both in-person and online participation with the students.

The EERC holds an unwavering commitment to the health and well-being of its employees, partners and clients, and the global community. As such, precautionary measures have been implemented in response to COVID-19. Staff continue to carry out project-related activities remotely, and personnel supporting essential on-site laboratory and testing activities are proceeding under firm safety guidelines. Travel has been minimized, and protective measures are being undertaken for those who are required to travel. At this time, work conducted by EERC employees is progressing with minimal disruption. Challenges posed by economic variability will be met with open discussion between the EERC and project partners to identify solutions. The EERC is monitoring developments across the nation and abroad to minimize risks, achieve project goals, and ensure the success of our partners and clients. In the event that any potential impacts to reporting, scope of work, schedule, or cost are identified, they will be discussed and addressed in cooperation with the project partners.

STATE ENERGY RESEARCH CENTER
Quarterly Progress Report
October 1 – December 31, 2020

INTRODUCTION

The State Energy Research Center (SERC), carried out by the Energy & Environmental Research Center (EERC), was established through Bill 2249 of the North Dakota 66th Legislative Assembly. The legislation included \$5 million of funding per biennium to fulfill three objectives: 1) conduct exploratory, transformational, and innovative research of technologies and methodologies that facilitate the prudent development and clean and efficient use of the state's energy resources; 2) provide greater access to energy experts for timely scientific and engineering studies to support the state's interests; and 3) educate stakeholders on issues related to the state's energy resources through public outreach. These objectives are being executed through three corresponding tasks:

- Task 1 – Perform Exploratory Research for North Dakota Energy
- Task 2 – Provide Prompt Expertise for North Dakota
- Task 3 – Advocate and Educate Through Outreach

The following represents the activity of SERC for this quarter. It should be noted that because of the potential opportunities for intellectual property (IP) development, technical activities are only presented at a high level to avoid negating the opportunity to protect the IP in the future.

HIGHLIGHTS AND ACCOMPLISHMENTS DURING REPORTING PERIOD

Task 1

Multiple projects are being conducted through this task, each focused on early-stage, exploratory energy research topics applicable to North Dakota, e.g., coal, oil and gas, wind, solar, and biofuels. Projects are selected by the EERC based on their potential to positively impact North Dakota, its industries, and its citizens. Research is focused on technology and strategy development that will ultimately lead to commercial application with public and private sector partners. Specific activities may involve other institutions of higher education in North Dakota as needed to achieve success.

Significant Task 1 accomplishments during the reporting period included the following:

- An update on SERC activities was presented to the North Dakota Industrial Commission (NDIC) on October 22.
- Three new invention disclosures were submitted by researchers, making seven total invention disclosures resulting from SERC activities to date. Several of the inventions are currently being considered for patent protection.

- An overview of the active SERC projects under Task 1, as well as specific activities conducted on each during the reporting period, is presented below.

Crude Oil Swelling with Injected Rich Gas and CO₂ as a Potential Mechanism for Enhanced Oil Recovery in the Bakken

Injecting Bakken rich gas and/or CO₂ captured from industrial sources to achieve even a 1% increase in recoveries would yield over a billion barrels of additional oil. The EERC has shown that both rich gas and CO₂ can solvate Bakken crude oil and recover oil from Bakken rock samples. However, a major enhanced oil recovery (EOR) mechanism—crude oil swelling—has not yet been studied to understand its potential role in recovering more oil. The purpose of this project is to determine the volumetric swelling that occurs with CO₂ and rich gas hydrocarbons at different pressures and reservoir temperatures to better understand the effect of crude oil swelling on EOR success in the Bakken.

Activities for this project during the reporting period included the following:

- Data from the swelling tests performed to date were reviewed and assessed for consistency/quality. It was determined that some early test runs required additional verification. Specific runs were selected for replicate testing to complete the full set of swelling data with the five test gases. Tests with propane and Bakken crude oil, with and without water, were rerun.
- Different, independent methods were used to calibrate the swelling factor and compared to literature values. Results were generally in good agreement, although not in all instances.
- Select results showing unexpected nonclassical behavior where swelling continues above minimum miscibility pressure (MMP) with ethane and propane are being evaluated with other EERC oil and gas researchers for review, comment, and interpretation.

Bench-Scale Extraction of Rare-Earth Elements from Lignite Coal Ash

Previous work has identified coal and coal by-products as a potential source for rare-earth elements (REEs). The goal of this project is to demonstrate at the bench scale a novel, economically viable, and environmentally benign process for extracting and concentrating REEs from low-rank coal (LRC) ash. Methods of REE extraction and concentration will be developed or improved to take advantage of unique properties of LRC fly ash, such as by altering the mineralogy to improve REE mobilization and solubility.

Activities for this project during the reporting period included the following:

- The initial suite of ash samples for this project were selected. These include 1) Coal Creek Station fly ash, 2) Spiritwood Station baghouse ash, 3) Antelope Valley Station baghouse ash, and 4) Milton R. Young (MRY) fly ash from the EERC's portable

slipstream baghouse (which had been set up in support of a non-SERC project). Other ash materials may be added in the future, but these four ashes represent the target materials. Of the four ash materials, two have been analyzed for REE content, with the remaining two materials in the analysis queue to be completed next quarter.

- The preparation and extraction of these initial samples represent a unique REE extraction process with the potential to dramatically lower the cost of REE extraction from LRC ash material. Scandium has been targeted in this initial work as it is by far the most valuable of the REEs.
- As reported in the previous quarterly progress report, an extraction method using an organic ligand solution was tested. Initial results suggest this ligand is effective at selectively extracting scandium and thorium; however, removing these elements from the ligand has proven challenging. Methods for removing scandium and thorium from the ligand will continue to be explored next quarter.

Corn Oil Extraction Efficiency Optimization

The goal of this project is to develop an innovative corn oil extraction technology capable of achieving greater than 50% recovery from process streams within a traditional dry mill ethanol plant. This goal will be achieved by 1) investigating literature and recent patents for relevant information regarding extraction pathways for corn oil extraction at various locations throughout a dry mill ethanol plant process and 2) creating a test matrix to perform corn oil extraction using up to three techniques on feedstock obtained from various points in the dry mill ethanol plant process.

Activities for this project during the reporting period included the following:

- Existing literature, previous research, and current technology continued to be reviewed. An initial experimental plan and test matrix were created based on typical operating conditions found in literature.
- The experimental setup was finalized and prepared, including purchase of supplies and collection of feedstock for the tests. Testing will begin next quarter.

North Dakota Wind Turbine Blade Recycling

As wind turbine blades reach the end of their useful lives and demand grows for technologies to avoid landfill disposal, each section of the blade can be repurposed in different applications to optimize value. The goal of this project is to evaluate the potential to make high-value products from retired wind blades. To achieve this goal, several objectives will be performed, including 1) a literature review of the current state of the art and past efforts to recycle fiberglass, 2) laboratory measurement of strength and chemical properties of different wind blade segments, and 3) technical and economic assessment of proposed end uses.

Activities for this project during the reporting period included the following:

- A methodology was developed to separate blade materials for further processing.
- The project ended in October 2020 and is considered complete. An internal final technical report was prepared and submitted to the EERC SERC program manager. Findings from this project will be presented in the subsequent SERC annual report.
- A proposal for follow-on work was submitted to an outside funding opportunity. The results of this project supported the development of this proposal, which includes industry and state partners.

Electrochemical Pathways for Enhanced Ethanol Synthesis at Near-Zero CO₂ Emissions

This project will evaluate the viability of electrochemical options to enhance and maximize ethanol yield and minimize CO₂ emissions. Variations of two electrochemically enhanced pathways will be evaluated, both of which have the potential to significantly improve ethanol yield and reduce CO₂ emissions.

Activities for this project during the reporting period included the following:

- The direct electrochemical conversion of glucose to ethanol was successfully performed using a custom-made reactor. Following validation of ethanol production, the remaining glucose concentration in solution was estimated using titrimetric methods. This was performed to confirm the efficacy of this conversion method. The enhancement of the glucose fermentation process using electrical methods will be tested next.
- This approach will be discussed with a North Dakota ethanol producer, and a sample of industrial broth for ethanol production will be secured for testing.

Toward a Real-Time Detection of Buried Pipelines and Spills in North Dakota

This project is using geophysical data combined with state-of-the-art data processing/integration algorithms to develop a method to reduce the turnaround time to detect buried pipelines and spills based on their geophysical signature. An aeromagnetic geophysical baseline survey using an unmanned aerial system (UAS) and surface and subsurface sensors will be conducted. Data analytics and machine learning will be used to attempt to identify the buried pipeline and may lead to an optimum method for monitoring leaks from buried pipelines.

Activities for this project during the reporting period included the following:

- Buried pipe testing was conducted in a controlled environment adjacent to the EERC. The technology was shown to successfully detect various orientations of pipe and the potential to detect spills. Funding opportunities for more extensive testing are being pursued.

- The project ended in October 2020 and is considered complete. An internal final technical report was prepared and submitted to the EERC SERC program manager. Findings from this project will be presented in the subsequent SERC annual report.

Developing Value in North Dakota's Produced Geologic Brines

Finding alternative uses for brines produced from oil and gas production, and those that may occur from geologic CO₂ sequestration, is of significant interest. This project is focused on converting the salt present in these brines from chlorides to other materials. This substitution could result in a slate of products from brine that aligns well with energy activities in North Dakota.

Activities for this project during the reporting period included the following:

- The project ended in October 2020 and is considered complete. An internal final technical report was prepared and submitted to the EERC SERC program manager. Findings from this project will be presented in the subsequent SERC annual report.
- A proposal submitted to the Advanced Research Projects Agency–Energy (ARPA-E)—mentioned in the previous quarterly progress report—was awarded funding. The new project is based on concepts identified through this SERC project and will provide an avenue for experimental evaluation.

Evaluating Shared-Border Analysis for Classifying Unconventional Reservoirs in North Dakota

Microstructure impacts production, EOR, and CO₂ storage in unconventional tight reservoirs. Shared-border analysis, a novel image analysis process for field emission scanning electron microscope (FESEM) results, can be used to characterize microstructural parameters for understanding and predicting unconventional reservoir behavior. The goal of this project is to advance shared-border analysis for use during laboratory analysis of unconventional reservoir rock to better characterize and identify the processes affecting fluid transport in these reservoirs.

Activities for this project during the reporting period included the following:

- The functionality of this technique was shown be successful in identifying the unique components of Bakken shale.
- The project ended in October 2020 and is considered complete. An internal final technical report was prepared and submitted to the EERC SERC program manager. Findings from this project will be presented in the subsequent SERC annual report.
- Initial discussions were held with the U.S. Geological Survey (USGS) about possible collaboration using techniques developed through this project.

Enhancing Stimulated Reservoir Volume Through a New Refracturing Approach

Development of a well-refracturing schedule based on reservoir pressure depletion can lead to optimal estimated ultimate recovery (EUR) of oil and increased cost-effectiveness of refracturing. The goal of this project is to develop an ideal time for scheduling refracturing to increase stimulated reservoir volume (SRV) and total recoverable hydrocarbons around individual wells. The objectives to achieve this goal are to develop the relationship between the reverse stress and reservoir pressure depletion, determine the effect of reverse stress on refracture orientation, and generate a new approach for calculating the stimulated reservoir area.

Activities for this project during the reporting period included the following:

- Various simulations were run and the results analyzed to understand the effect of reservoir pressure depletion on refracturing.
- The project ended in November 2020 and is considered complete. An internal final technical report was prepared and submitted to the EERC SERC program manager. Findings from this project will be presented in the subsequent SERC annual report.

Hosting Capacity Analysis for Improved Planning and Operations of North Dakota Distribution Networks

Hosting capacity analysis (HCA) can be used as a grid modernization tool for realizing an economical, reliable, and resilient electric grid that accommodates customer-centric distributed energy resources (DERs) and ensures reliability by alleviating operational boundary violations caused by higher penetration of DERs. The goal of this project is to develop a dynamic grid model that can provide a real-time snapshot of the distribution grid to understand hosting capacity of the feeders, evaluate the feasibility of the location of the DER, and determine the effects of DERs on the entire distribution system. Project efforts include data collection, creating and optimizing a distribution grid model, and evaluating hosting capacity.

Activities for this project during the reporting period included the following:

- An initial grid model for the Mountrail-Williams Electric Cooperative area has been created; however, challenges were encountered with the distribution system-planning software (Synergi) being used on the project – the software was not operating correctly. Following the release of an updated version of the software, these issues have been corrected and the project will be able to continue next quarter.

Exploration of Opportunities and Challenges for a North Dakota Petrochemical Industry

The goal of this study is to provide data and insight about the myriad factors influencing the creation of a successful petrochemical industry and provide a framework for state actions and strategy development. This may include highlighting specific opportunities and identifying factors that prevent investment and for which further effort may be needed (research, policy, regulatory actions, etc.). A series of activities will be conducted, including geologic storage

characterization and evaluation, feedstock characterization, gas conversion pathway assessment, and regional market investigation.

Activities for this project during the reporting period included the following:

- Simulations to predict gas composition changes after the production of stored gas were performed. Laboratory core flooding experiments were performed to evaluate the residual oil in the target study area (Dickinson Lodgepole Mounds) following water and ethane injection.
- The petrochemical market analysis was completed using a combination of purchased and publicly available petrochemical data sets.
- The project ended in December 2020 and is considered complete. An internal final technical report was prepared and submitted to the EERC SERC program manager. Findings from this project will be presented in the subsequent SERC annual report.

Silica Nanoparticles from North Dakota Lignite Fly Ash

North Dakota lignite power generation facilities annually produce almost 3 million tons of fly ash. Less than 50% is sold, principally for cement production, and the remainder is disposed of in landfills or impoundments located on the utility site. Because of the availability and essentially negative cost of the fly ash, the potential exists for a lower-cost route to multifunctional silica materials, principally silica nanoparticles and mesoporous silica. The goal of this project is to expand the technology portfolio for up-valued North Dakota lignite-derived products. This will be accomplished through two objectives: 1) evaluating the potential suitability of North Dakota lignite fly ashes as feedstocks to produce silica nanoparticles using nontraditional routes and 2) performing high-level cost-of-production analysis and comparison to literature for state-of-the-art sol-gel processes.

Activities for this project during the reporting period included the following:

- Silica nanoparticle production using a sol-gel process continued. The recovered particles were submitted to the EERC laboratory for scanning electron microscopy (SEM) analysis.
- A second pathway for producing silica nanoparticles using a fungal bioleaching process was initiated. A nutrient broth was prepared, and fungi was grown and recovered. The recovered fungal mass was blended with the fly ash samples. The solids obtained from this process were submitted to the EERC laboratory for SEM analysis.
- The SEM results from both processes were analyzed.

Novel Concepts in Support of Lignite Coal

This project has four distinct subactivities, all of which have the goal of gaining knowledge or developing techniques/technologies to support the continued use of North Dakota lignite for power and premium products:

1. PFAS Destruction Through Cocombustion with North Dakota Lignite

The goal of this subactivity is to conduct a paper study to provide initial methods, procedures, and data to inform decision making regarding thermal destruction of PFAS (polyfluoroalkyl substances)-containing wastes. Specifically, the project will address combustion (incineration) of PFAS in existing lignite-fired facilities.

2. Electrochemical Extraction of REEs from North Dakota Lignite

The goal of this subactivity is to explore the potential to use electrochemical methods for efficient and economical extraction of REEs from North Dakota lignite.

3. CFD (computational fluid dynamics) Modeling of Novel 3D Packing Structure for CO₂ Capture Columns

The goal of this subactivity is to identify opportunities for novel packings with application to CO₂ capture.

4. Production Cost Model to Evaluate Cycling of Coal-Fired Plants

The goal of this subactivity is to develop a pathway for identifying and addressing the cycling operations of North Dakota coal-fired power plants that may result from increasing penetration of renewable energy sources.

Activities for this project during the reporting period included the following:

1. PFAS Destruction Through Cocombustion with North Dakota Lignite

- This project provides initial information (methods, procedures, and data) to inform decision-making relative to the implementation of thermal destruction of PFAS-containing wastes. Specifically, the project addressed combustion (incineration) of PFAS in existing North Dakota-based lignite-fired facilities. Results of this work indicate that North Dakota's lignite facilities would likely not adequately destroy PFAS, and therefore, using these facilities for this purpose is not recommended.
- The project ended in December 2020 and is considered complete. An internal final technical report was prepared and submitted to the EERC SERC program manager. Findings from this project will be presented in the subsequent SERC annual report.

2. Electrochemical Extraction of REEs from North Dakota Lignite

- Lignite coal samples were digested in an acid solution and mixed with ionic liquids. The electrodeposition of REEs was performed using various solutions and multiple electric potentials. Initial results indicate REEs can be successfully electrodeposited.

- Testing was performed to evaluate the ability to extract lithium using electrochemical methods. Catalyst-based electrodes were fabricated, and laboratory test samples were prepared. Extraction testing was performed using a lithium chloride solution. Results from the extraction testing were evaluated.
- The project ended in December 2020 and is considered complete. An internal final technical report was prepared and submitted to the EERC SERC program manager. Findings from this project will be presented in the subsequent SERC annual report.

3. CFD Modeling of Novel 3D Packing Structure for CO₂ Capture Columns

- A conceptual 3D structured packing was designed, and CFD modeling was attempted; however, complications with the CFD modeling prevented simulation results from being obtained.
- The project ended in December 2020 and is considered complete. An internal final technical report was prepared and submitted to the EERC SERC program manager. Findings from this project will be presented in the subsequent SERC annual report.

4. Production Cost Model to Evaluate Cycling of Coal-Fired Plants

- North Dakota and South Dakota coal plant operators were contacted to gain insight on real-world operational cycling. Based on input from these operators, multiple operational scenarios were developed.
- A model framework that includes a production cost model under increased cycling operations was discussed, with reference to the scenarios created with operator input.
- The project ended in December 2020 and is considered complete. An internal final technical report was prepared and submitted to the EERC SERC program manager. Findings from this project will be presented in the subsequent SERC annual report.

Analytical Analysis of Gas Injection EOR in the Bakken and Measuring Injected Gas Penetration Rates into Bakken Rock Cores

Improving oil recovery in the Bakken petroleum system (BPS) relies on the ability to clearly understand the flow mechanisms and accurately control the fluid flow in both fractures and matrix. This project is investigating the fundamental mechanisms involved in the Bakken EOR process. This investigation will include developing methods to experimentally measure the linear penetration rate of CO₂ and hydrocarbon gases into BPS rock core samples. Using existing and new data, a model will be developed to investigate EOR performance in the BPS.

Activities for this project during the reporting period included the following:

- The fundamental flow mechanisms (e.g., viscous flow, diffusion, and adsorption) were separated in the existing analytical models.

- The development of new analytical models for the Middle Bakken and Three Forks Formations began. An equation for 1D flow that includes viscous flow and diffusion in tight unconventional reservoirs was developed. This equation is designed to describe gas penetration through the tight rock matrix during gas injection for EOR. Modeling solutions for constant pressure gas injection in tight unconventional reservoirs were developed. The models will be updated if isotherm data are able to be obtained from the laboratory experiments.
- A constant pressure injection test (1D flow-through flooding test) was designed to mimic flow behavior during EOR.
- Laboratory experimentation to obtain isotherm data continued. Test runs using ethane were performed. Evaluation of the data is ongoing.

Laboratory Proof of Concept of Microbubble CO₂ and Microbubble Rich Gas Enhanced Oil Recovery for Application in North Dakota Oil Plays

Microbubble CO₂ and microbubble rich gas EOR can improve permeation rates, sweep efficiency, and EUR relative to continuous gas injection for low-permeability Red River and tight Bakken plays. This project is focused on 1) providing a first-of-a-kind proof-of-concept of microbubble CO₂ EOR for application to tight unconventional plays, 2) benchmarking the performance of microbubble CO₂ injection compared to continuous-phase CO₂ injection for North Dakota Middle Bakken and Red River EOR applications, and 3) demonstrating that microbubble EOR is compatible with rich gas components/blends, and assessing microbubble rich gas EOR performance relative to microbubble CO₂ EOR performance.

Activities for this project during the reporting period included the following:

- All rock samples that will be used for testing were successfully obtained. A non-Bakken rock sample was used in initial tests to establish the testing procedure and optimize the experimental setup. These tests demonstrated very repeatable initial and final oil saturations. The system showed improvement in oil recovery in these early tests.
- Experiments using Middle Bakken samples to evaluate the initial repeatability of CO₂ injection began.
- Core samples were shipped to project partner RITE (Research Institute of Innovative Technology for the Earth) in Japan. RITE is the creator of the microbubble technology being adapted for use on this project and will be conducting testing on duplicate core samples to allow comparison of results.

Task 2

This task allows quick and efficient access to energy experts from the EERC for timely scientific and engineering studies to support the state's interests. Through this task, SERC has the ability to both react to and proactively address issues that have the potential to impact the

state's energy (and other, if appropriate) industries. All projects conducted through this task are at NDIC's discretion.

Significant Task 2 accomplishments during the reporting period included the following:

- The project entitled "Assessing North Dakota's Energy Future," which began April 1, continued:
 - The initial draft system dynamics model was presented to the project team and other subject matter experts. The model was refined based on input from these groups. Several scenarios were simulated, and the results were used to tune the model.
 - An update on this study was presented to NDIC on December 15.
 - The capabilities of the model were presented to several North Dakota legislators.
 - This project was originally scheduled to be completed in December; however, following discussion with NDIC, the decision was made to extend the project to June 30, 2021. This additional time will allow further refinement of the model and opportunity to use the model to support the North Dakota Legislative Session.

Task 3

This task consists of outreach activities to advocate for, and educate about, North Dakota's energy industries. Work conducted under this task will involve a variety of outreach tools and activities that may include fact sheets; training workshops; websites; on-site tours and presentations to school and community groups; and participation in international, national, and regional trade press, television, radio, peer-reviewed literature, interviews, and conference presentations. Two specific activities are the Energy Hawks and the Energy Outreach Collaboration Programs.

Significant Task 3 accomplishments during the reporting period included the following:

- *Energy Outreach Collaboration Program*
The E-Portal web-based energy education information system was updated with additional information from the EERC.
- *Energy Hawks Summer Internship Program*
 - Planning for the 2021 Energy Hawks Program was initiated, which will include 14 students, including eight students from the University of North Dakota (UND) and six from other North Dakota institutions. Contacts were made with North Dakota State University, Bismarck State College, Minot State University, Williston State College, and Turtle Mountain Community College to help with student recruitment. Plans are being made to allow both in-person and online participation with the students.

FINANCIAL INFORMATION

This project is sponsored by NDIC. Table 1 shows the proposed budget of \$5,000,000 for this project and expenses through December 31, 2020.

Table 1. Project Cost

Task	Budget	Expended	Balance
1 – Exploratory Research	\$3,875,241	\$3,087,441	\$787,800
2 – Prompt Expertise	\$500,000	\$242,876	\$257,124
3 – Advocate & Educate	\$624,759	\$411,133	\$213,626
Totals	\$5,000,000	\$3,741,450	\$1,258,550

PLANNED FUTURE ACTIVITIES

The following activities are planned for the next quarter.

Task 1

- Work on the currently funded projects will continue.

Task 2

- The project “Assessing North Dakota’s Energy Future” will continue its efforts, with the completion of the project in June and a final report following within 30 days of the effort.

Task 3

- Data and other relevant materials will be added to the E-Portal system as appropriate.
- The 2021 Energy Hawks summer internship program will continue planning efforts to recruit students from UND and other institutions of higher education in North Dakota.